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Research Article

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Study of soil-fodder-serum mineral interrelationship in saline tract area of Akola district of Maharashtra state

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Summary

The present study was conducted in saline affected villages of Purna river valley of Akola district of Maharashtra to establish the soil, fodder and serum mineral interrelationship. Total 104 soils, 71 fodders and 360 serum samples of animals were collected and subjected for micro mineral estimation. The study revealed non-significant multiple correlation co-efficient between soil-fodder-animal for Cu, Fe and Mn, however, the direction between correlation found positive, indicating the direct association between soil-fodder and animal. The overall study concluded that the multiple correlation co-efficients between animal-soil-fodder for Zn found highly significant indicated positive association between animal-soil-fodder for Zn in saline tract area of Akola district. Present study concluded that low Zn content in soil reflected in fodder grown on this soils and animals maintained in saline tract area of Akola district.

Key words : Soil, Fodder, Serum, Correlation, Micro-mineral, Animal, Salinity

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Introduction

In Vidarbha region of Maharashtra State (India), the Purna river valley is the unique tract of vertisols having native salinity /sodicity. These soils have appreciable amount of $CaCO_3$ (Sagare *et al.,* 1991) and precipitation of Ca in the form of $CaCO_3$, which greatly immobilizes Ca and Mg in these soils and dominance of Na is increased which affects the physical and chemical properties of soil adversely. The ground water which is also alkali in nature makes the situation more problematic (Sagare *et al.,* 2000). It has been reported that the salinity of soil affects the crop yield and interferes the uptake of nutrients to the plants.

The plants derive their minerals from soil and the animals from the plants/feed they consume. Plant mineral content virtually depends on type of soil, plant species, stage of maturity, pasture management and agro-climatic conditions (Mc Dowell *et al.,* 1993). Low concentration of a particular mineral in soil will lower the mineral content in plant grown on such soil. The availability of minerals to plants is controlled by their total concentration in soil and competitiveness along with antagonistic relationship of their chemical form. Therefore, there is direct interrelationship between soil, plant and animal (Prasad *et al.,* 1999).

The study on micro mineral status of soil–plant-animal and their relationship in saline tract area of Purna river valley has not been undertaken so far. In view of

the fact, the present study was undertaken to establish the soil, fodder and serum mineral interrelationship in saline tract area of Akola district of Maharashtra state.

Resource and Research Methods

The present study was conducted in saline affected villages of Purna river valley of Akola district. Total seven villages from saline tract area of Akola district *viz.*, Gopalkhed, Gandhigram, Hata, Hingna-Tamaswadi, Karanja-Ramzanpur, Andura and Nimbhora were selected by adopting multistage stratified sampling technique. A total of 104 soil, 71 fodder and 360 serum samples from cows and heifers were collected for laboratory analysis.

Available micro-minerals *viz.*, Cu, Zn, Fe and Mn were determined by using DTPA (Diethylene Triamine Penta Acetic Acid) as extractant using Atomic Absorption Spectrophotometer (AAS) model SHIMADZU-AA 6300. Micro-minerals *viz.*, Cu, Zn, Fe and Mn in fodder and serum were determined by using Atomic Absorption Spectrophotometer (AAS) model SHIMADZU-AA 6300 after digesting the samples. Collected data were analyzed statistically as per the method described by Snedecor and Cochran (1994).

Research Findings and Discussion

The average micro mineral concentrations in soil, fodder and serum in saline affected area of Purna river valley of Akola district are given in Table 1.

In the present study average Cu content in soil and fodder was above the critical level indicated that the soil and fodder samples contained adequate amount of Cu (Table 1). The findings of the present study are in accordance with the results of Patil *et al.* (2004) who also reported similar trend of soil Cu content in saline affected villages of Purna river valley of western Vidarbha region. The serum Cu level was normal in cows maintained in saline tract area of Akola district. The correlation co-efficient study revealed non-significant correlation co-efficient between all the combinations of Cu (Table 2).

However, the direction between correlations of all the combinations found positive, which indicates the direct association between all the combinations of correlations. The multiple correlation co-efficient between animal – soil – fodder of Cu indicates that there is a positive association between animal – soil - fodder irrespective of Cu content however, the magnitude of correlation found non-significant (Table 2).

The average concentration of Zn in soil was low indicated deficiency of Zn in soil. Patil *et al.* (2004) also reported deficiency of Zn in soil of saline affected villages of Purna valley of western Vidarbha region. The fodder samples collected from this area contained low concentration of Zn indicated deficiency of Zn in fodder. Low soil content of Zn might have reflected in fodder grown on deficient soils. Udar *et al.* (2003) and Hussain (2006) also reported low Zn content in fodder of western Vidarbha region. The serum Zn concentration was found low in animals maintained in this area (Table 1). Similar findings were also recorded by Hussain (2006) in cows

Table 1: Mean values of micro minerals in soil, fodder and serum in saline affected villages of Purna river valley of Akola district

Sr. No.	Elements	Soil	Fodder	Serum
1.	Cu (ppm)	0.49 ± 0.07 (0.3)	32.43 ± 2.17 (8.0)	0.76 ± 0.01 (0.6)
2.	Zn (ppm)	0.79 ± 0.12 (1.0)	26.29 ± 2.31 (30.0)	0.57 ± 0.02 (0.6- 0.8)
3.	Fe (ppm)	5.88 ± 0.42 (2.5)	191.28 ± 9.64 (50.0)	1.65 ± 0.02 (1.0)
4.	Mn (ppm)	4.73 ± 0.47 (5.0)	49.06 ± 2.84 (40.0)	0.37 ± 0.01 (0.3)

(Figures in parenthesis indicate critical values) Critical values Mc Dowell (1992) and Pattanaik (2001)

Table 2: Correlation co-efficients of micro minerals of soil – fodder – serum of cows of saline affected villages of Purna valley of Akola district

Sr. No.	Combination for correlation	Cu	Zn	Fe	Mn
1.	Animal – soil (Rxy)	0.37^{NS}	-0.56^{NS}	0.08	-0.19^{NS}
2.	Animal-fodder (Rxz)	0.03^{NS}	-0.61^{NS}	0.00^{NS}	0.56^{NS}
3.	Soil-fodder (Ryz)	0.31^{NS}	-0.19^{NS}	-0.12^{NS}	0.05^{NS}
4.	Rx(yz)	0.38^{NS}	0.91**	0.08^{NS}	0.60^{NS}

Variables	5%	1%
2	0.707	0.834
3	0.795	0.886

** indicates significance of value at P=0.01
NS= Non-significant

of Akola district of Vidarbha region. This might be due to low content of Zn in feed and fodders consumed by the animals of saline tract area of Akola district.

All the combinations of correlations of Zn found statistically non-significant, however, the direction between correlations of all the combinations found negative. The multiple correlation co-efficient between animal- soil - fodder of Zn was found statistically highly significant ($P<0.01$), which indicates that there was significant positive association between animal – soil - fodder in respect of Zn content (Table 2).

The average concentration of Fe in soil was above the critical value (Table 1). The finding of present study is in agreement with the findings of Patil (2006) who also observed similar range of soil Fe in saline tract of area of western Vidarbha region. The Fe concentration in fodder of saline affected area of Akola district was higher. The serum Fe level was normal in cows of saline affected area of Akola district. The interrelationship study revealed non-significant correlation co-efficient between all the combinations of correlations, however, the direction between correlation of animal- soil and animal – fodder was found positive, whereas soil – fodder was found negative. These findings suggested that there is direct association between animal-soil and fodder- animal in respect of Fe. The multiple correlation co-efficient found non-significant for Fe (Table 2) however, there is a positive association between animal – soil –fodder.

The Mn content in soil was very close to the critical value (Table 1). The findings of the present study are in accordance with the findings of Patil *et al*. (2004) who also reported similar range of soil Mn concentration in saline affected area of Western Vidarbha region. The Mn content in fodder was adequate in saline affected area of Akola district. However, serum Mn level was very close to the critical level indicated marginally low level of Mn in animals of this area (Table 1). All the combinations of correlations found to be statistically non-significant, however, the direction between correlations of animal –fodder and soil-fodder for Mn content found positive, whereas animal-soil found negative. These findings suggested that there is direct association between fodder- animal and soil-fodder. The multiple correlation coefficient between soil-fodder-animal found non-significant (Table 2), however, there is a positive association between animal – soil and fodder.

The results of the present study indicated that the status of various micro minerals in soil of saline tract area of Akola district might not reflected as much in fodders grown on these soils and animals maintained in this area. It could be attributed to interaction of minerals amongst each other, soil pH, fertilizers etc. (Prasad and Gowda, 2005).

Conclusion :

The overall study concluded that the multiple correlation co-efficients between animal-soil-fodder of all the elements found statistically non-significant except Zn. The multiple correlation co-efficients between animal-soil-fodder for Zn found statistically highly significant indicated that there is a positive association between animal-soil-fodder for Zn in saline tract area of Akola district. Thus, low Zn content in soil reflected in fodder grown on this soils and low serum Zn level in animals maintained in saline tract area of Akola district.

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